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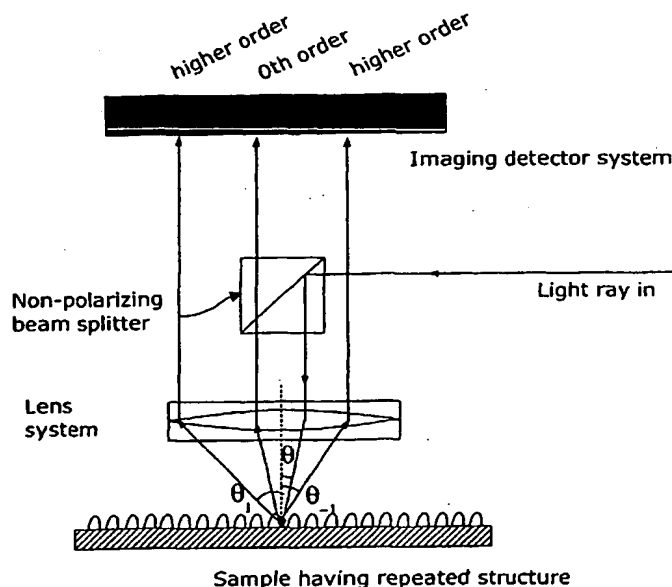
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(54) Title: METHOD AND APPARATUS FOR OPTICALLY MEASURING THE TOPOGRAPHY OF NEARLY PLANAR PE-
RIODIC STRUCTURES



(57) Abstract: The present invention
discloses a non-destructive method and
apparatus for measuring the 3D topography
of a sample having periodic microstructure
deposited onto the surface, or deposited
onto a film, or buried into the film or
sample. In particular, the present invention
relates to an optical system and method
utilizing polarized light beam, diffracted
from the repeated structure, to measure
its spatial geometry giving parameters
such as profile height, profile widths,
sidewall angles, and arbitrary profile shape.
The optical system employs a broadband
or semi-monochromatic light source to
produce a light beam that is polarized
and focused onto the periodic structure
being measured. The focused beam
consists of a whole range of illumination
angles that is provided to the structure
simultaneously. Transmitted or reflected
diffracted light generated by the interaction
of the light with the periodic structure is
collected by an imaging detector system.
The detector records the diffraction light
irradiance resolved into illumination

angles, diffraction orders and wavelength. The data is applied to determine the geometrical profile of the periodic structure using a reconstruction algorithm that is based on comparisons between measured diffraction data and modeled diffraction of a profile model using Maxwell's equations. The reconstruction of the profile is performed by iterative adjustments of a profile seed model until the modeled diffraction irradiance matches the measured data within a predefined convergence tolerance.

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